

Re Box No. V

Prior art

1. In the present opinion, reference is made to the following documents:

D1 = US 2002 0011762 A

D2 = EP 1 164 271 A

Claims 1 and 8

2. The present application does not meet the requirements of Article 33(1) PCT, because the subject matter of claims 1 and 8 is not based on an inventive step as defined in Article 33(3) PCT.
 - 2.1. A control method and a control device for an *injection valve for charging and/or discharging* a piezoelectric actuator of the valve using a *setpoint value* and a *controlled variable* which *reflects the charge status of the actuator and/or the valve position* is already known from D1 (paragraph 24, 28; claims and figures).

Please note: D1 does not mention the use of the *pressure at the valve* (or similar variables) for regulating the controller behavior of the charging and/or discharging of the actuator. D1 describes how a piezoelectric actuator for an injection valve can be operated, but not the injection strategy or, as the case may be, the regulation of the combustion engine.

Please note: The *pressure at the valve* of a direct injection valve corresponds to the pressure in the cylinder and is typically measured by means of a pressure sensor on the cylinder and forwarded to the engine control unit.

In the prior art, a cylinder pressure signal is often used for different purposes, as well as for controlling the fuel injection.

- 2.2. An example of this is disclosed in D2. D2 has a control method and a control device for an injection valve in which the injection is a multi-stage injection (Figures 4 and 8; paragraph 12). In this case a cylinder pressure sensor (element 20, Figure 1, column 4, lines 20-24; claims 4 to 7) is used whose signal is detected (claim 1; column 6, lines 37-41; paragraph 36; Figure 14) and as a function of which the

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controller behavior is regulated (column 6, lines 41-46; Figures 23-27; claim 9).

Please note: D2 does not relate to any specific actuator (e.g. magnetostrictive, piezoelectric or magnetic). Nonetheless, it is obvious to the person skilled in the art to apply the teaching of D2 to a piezoelectric actuator. D2 does not describe how a piezoelectric actuator can be operated for an injection valve, but does describe the strategy for an optimal injection as a function of the *pressure at the valve* of an injector.

- 2.3. D1 and D2 mutually complement each other: D2 shows the injection strategy, while on the other hand D1 shows the control of a piezoelectric injection valve. In view of the statements contained in D2, the person skilled in the art would regard it as a typical approach to combine the control method and the control device of D1 with D2.
3. The further dependent claims 2 to 7 and 9 also appear not to be inventive in respect of D1 and D2.

Comments regarding the rest of the examining procedure

4. It is not indicated in claim 1 (and 8) how precisely the acquired external measured variable is intended to influence the controller behavior. For this reason, all documents which use the pressure at the valve for the injection are to be regarded as relevant for the inventive step in combination with D1.